Subject: [Fwd: Re: [Fwd: Conversion from ECMWf model variable to CRTM surface type]]
From: Erik Andersson <Erik.Andersson@ecmwf.int>
Date: Tue, 11 Aug 2009 11:03:41 +0100
To: Michiko Masutani <Michiko.Masutani@noaa.gov>, Gianpaolo Balsamo <Gianpaolo.Balsamo@ecmwf.int>
CC: Lars Isaksen <Lars.Isaksen@ecmwf.int>, Lars Peter Riishojgaard <Lars.P.Riishojgaard@nasa.gov>

Mitchiko,

Here is a comprehensive reply from G. Balsamo (Thanks!).
Please pass it on to those who raised the question.

Erik

-------- Original Message --------
Subject: Re: [Fwd: Conversion from ECMWf model variable to CRTM surface type]
Date: Tue, 11 Aug 2009 10:55:40 +0100
From: Gianpaolo Balsamo <Gianpaolo.Balsamo@ecmwf.int>
Reply-To: Gianpaolo.Balsamo@ecmwf.int
Organization: ECMWF
To: Erik Andersson <Erik.Andersson@ecmwf.int>

Hi Erik,

I've looked at the documentation "Convert ECMWF Surface Land type in
Nature Run to CRTM variables" by Ron Vogel, and my comment is that the
look-up table (ECMWF veg. type to CRTM) although containing some
inevitable arbitrary choices (e.g. "tall-grass" <--> "BROADLEAF_BRUSH")
seems reasonable. I think there are 3 points worth mentioning:

1) All non-vegetated surfaces (although present in the original BATS
classification adopted at ECMWF) are not accounted for, because we treat
for the moment only vegetated areas and bare ground.
That is done using 4 fields: TVL, TVH for the high and low dominant veg.
types (integer values 1 to 20), and CVL, CVH for the high and low cover
fraction (0-1).
The bare ground is given as a residual by the formula:
BARE_FRACTION = 1 - (CVL*RCOV(TVL)) - CVH*RCOV(TVH)
where the RCOV are the typical vegetated fractions of the given TVL, TVH
vegetation cover type of each grid-point.
The ECMWF model assumes bare ground in all non-vegetated areas
(disregarding whether it is a desert or a urban area.

2) Something slightly more accurate could be done instead with the snow.
Given the availability of snow-density (ECMWF variable RSN., gribcode 33
of table 128) this allows a precise calculation of snow depth (rather
than using a fixed scaling factor of 5 or 10 depending on snow-aging).
Fernando Prates has recently demonstrated (and showed in OD/RD meeting)
that the snow-depths calculated from snow-water equivalent and
snow-density are better matching the SYNOP snow-depth observations
(compared to fixed scaling method with a factor 10) and that motivated
the recent request to archive snow-density in EPS runs.

3) Finally the fraction of grid-point occupied by snow can be calculated
knowing the snow-water equivalent. For small amounts of snow we assume
only fractional coverage. That is given by:
SNOW_FRAC=MIN(1,SWE/SWE_crit)
With SWE being the snow water equivalent in m and SWE_crit=0.015m.

I hope this can provide some useful elements. The above formulae and a
description of the land surface model and ancillary fields can be found
in chapter 7 and 10 of the IFS physics documentation:
http://www.ecmwf.int/research/ifsdocs/CY31r1/PHYSICS/IFSPart4.pdf

Best regards,
Gianpaolo

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